ADS-B MASPS DO-242A
AdHoc Working Group Report

Presented at the SC186 Plenary Meeting
Redmond, Washington

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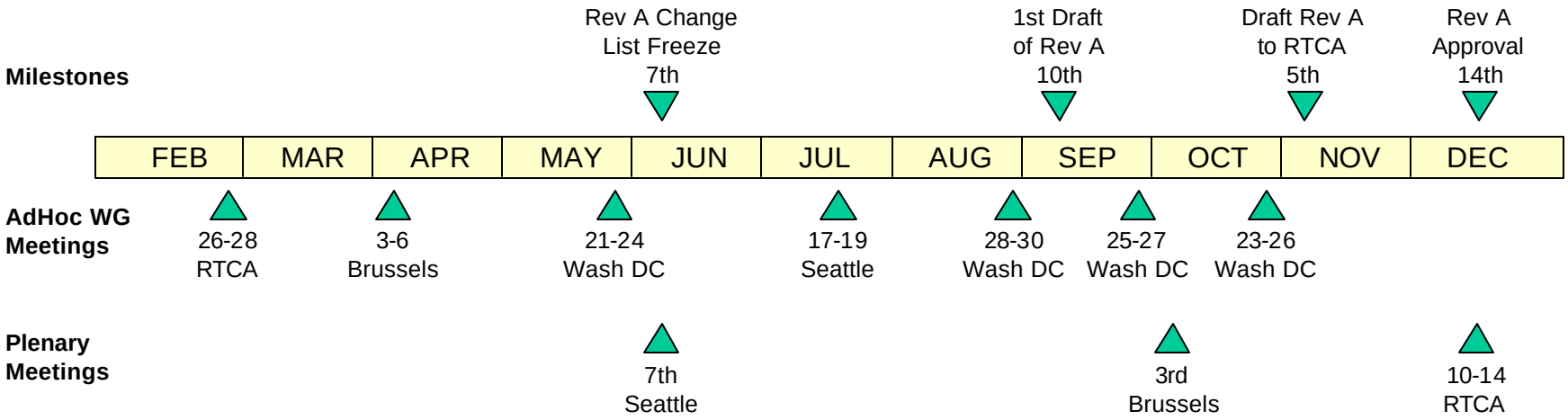
MASPS Change Process

- Criteria Defined for Considering Changes for Inclusion in Rev A
  - MASPS issues that need to be addressed to support near-term MASPS/MOPS development
  - Address application related change items only for applications that have well defined concepts of operation
  - Address items needed for harmonization with international requirements
  - Address items identified during recent ADS-B development activities and operational evaluations
  - MASPS document clarifications and corrections
  - Validation/modification of questioned MASPS requirements
  - For new requirements to be considered, they should be needed to support surveillance for traffic separation assurance
  - Military use provisions
- Use of Change Issue Papers (IP) to Document Issues and Considerations

Change Issue Paper Status

- Status as of May 21-24 Meeting
  - 40 IPs Total
  - 23 Active for Rev A
  - 4 Deferred
  - 5 Rejected
  - 8 Closed

AdHoc WG Timeline



ADS-B Position & Integrity Issue

- Navigation Integrity and Accuracy Metrics Needed for Required Surveillance Performance (RSP) Definition
  - Accuracy and Integrity are Independent Metrics:
    - Accuracy reflects nominal, unfailed performance
    - Integrity reflects rare normal / undetected anomaly performance
    - Integrity summarized by both a Containment Bound & Probability Level
- ADS-B MASPS Changes Recommended for DO-242A:
  - Separate Navigation Accuracy and Integrity Categories (NAC / NIC)
  - Allowed Probability Levels for Source Integrity also Explicitly Specified

Proposed Navigation Accuracy (NAC) Categories

NACp	Horizontal Error (95%)	Vertical Error (95%)	Comment
0	> 10 nm	Baro Alt	Accuracy Unknown
1	<10 nm	Baro Alt	RNP-10 Accuracy
2	<4 nm	Baro Alt	RNP-4 Accuracy
3	<2 nm	Baro Alt	RNP-2 Accuracy
4	<1 nm	Baro Alt	RNP-1 Accuracy
5	<0.5 nm	Baro Alt	RNP-0.5 Accuracy
6	<0.3 nm	Baro Alt	RNP-0.3 Accuracy
7	< 0.1 nm	Baro Alt	RNP-0.1 Accuracy
8	< 0.05 nm	Baro Alt	e.g. GPS
9	< 30 m	Baro Alt	e.g. GPS (No SA)
10	< 10 m	< 15 m	e.g. WAAS
11	< 3 m	< 4 m	e.g. LAAS

Proposed Navigation Integrity (NIC) Categories

NIC	Horizontal Containment	Comment
0	Unknown	No Integrity
1	<20 nm	RNP -10
2	< 8 nm	RNP -4
3	< 4 nm	RNP -2
4	< 2 nm	RNP -1
5	<1 nm	RNP -0.5
6	<0.6 nm	RNP -0.3
7	<0.2 nm	RNP -0.1
8	<0.1 nm	e.g. RAIM - GPS
9	<75 m	Future system
10	< 25 m	e.g. W AAS HPL
11	< 7.5 m	e.g. LAAS HPL
12…15	Reserved for future expansion	

Proposed Source Integrity Levels

- Provides integrity of the target's positioning source to allow a receiving system to assess the target's capabilities with respect to an operational procedure
- Undetected failure probability levels associated with the positioning source equipment

Integrity Level	Probability	Category
0	No Integrity Provided	Non-interfering / No Hazard
1	1 X 10^(-3)	Non-essential / Minor Hazard
2	1 X 10^(-5)	Essential / Major Hazard
3	1 X 10^(-7)	Critical / Severe Major Hazard

TCP Intent Issue

- Some issues identified with current TCP definitions and requirements:
  - Need for including TCP type information to better define target path at TCP
  - Need for defining TCP intent integrity requirements
  - No validation of the number of TCPs needed and transmission rates required to support intended using applications
  - Current MASPS requirements are incomplete and subject to misinterpretation
- Change recommendations for DO-242A:
  - Move current TCP requirements to Appendix with additional background information on TCP usage based on current work
  - Note in body of document that TCP requirements are still under development and will be included in future revision

Re-Organization of SV & MS Requirements

- Objective is to clarify current MASPS language and reduce mis-interpretation
  - Clarify minimum data requirements for all equipage classes
  - Clarify minimum data requirements by equipage class
  - Clarify minimum update requirements
  - Clarify desirable/optional data requirements
- Clarify distinction between ADS-B messages to be transmitted versus ADS-B reports to be generated by receiving side
  - Allows for link implementation, protocols, etc. requirements to be addressed outside of the ADS-B MASPS
  - Ensures that ADS-B reports are consistently generated for interoperable use by ADS-B applications

Other Proposed MASPS Change Items

- Re-definition of Capability Codes (was Class Codes)
- Addition of Aircraft Size Characteristics
- Clarification of “Certified Navigation Center” definition
- Clarification of “Anonymous Mode” ADS-B requirements
- Adding requirement for all equipage classes to provide “On-Condition” reports
  - Move air vector data to “On Condition” report
- Addition of “short term” intent and flight mode indicators
  - Selected altitude and selected heading (classes A2 &A3)
  - Flight mode indicators clarify AP/FMS control modes
  - Improves trajectory prediction and ATC clearance feedback

European Harmonization Areas

- Brussels meeting in April identified the following areas for initial harmonization focus
  - Equipage class definitions, e.g. A0, A1, A2, etc.
    - Ensure European class needs are covered by current MASPS class definitions
  - Non-TCP intent data definitions
    - Consistent definition for common parameters between ADS-B and Mode S Enhanced Surveillance
  - Flight Mode Indicator definitions
    - This relates to European Enhanced Mode S surveillance requirements and concepts where common aircraft integration concerns can be coordinated

Furture AdHoc WG Meeting Schedule

- 16-19 July in Seattle area
- 28-30 August in Washington DC Area
- 25-27 September in Washington DC area
- 23-26 October in Washington DC area

ADS-B AdHoc Working Group Web Site

- Open information exchange to parties
- Contains minutes, working papers, IP template, current IPs, and meeting schedules
- Web Site is Hosted on a FAA TC Web Server

http://adsb.tc.faa.gov

ADS-B MASPS Issue Papers

IP #	Current Status	Author	Description
IP01	Rev A	Stephen Heppe, ADSI, Inc	Turn indication is problematic and should be deleted as a required ADS-B message element
IP02	Rev A	Stephen Heppe, ADSI, Inc	Altitude rate is problematic and should be deleted as a required ADS-B message element.
IP03	Rev A	Stephen Heppe, ADSI, Inc	Effective received reporting rates should be adjusted to match operational requirements.
IP 04	Rev A	Gary Livack, FAA	Comments from 1090 MOPS ballot regarding broadcasting of own aircraft's size characteristics
IP 05	Rev A	Gary Livack, FAA	Comment from 1090 MOPS ballot regarding Anonymity Protection for GA aircraft.
IP 06	Rev A	Gary Livack, FAA	Comments from 1090 MOPS ballot regarding broadcasting of information from moving and stationary obstacles in and around airports.
IP 07	REJECTED	Gary Livack, FAA	Comments from 1090 MOPS ballot regarding broadcasting of additional information not currently specified in MASPS for future use.
IP 08	Rev A	James Maynard, UPS-AT	Comments from 1090 MOPS ballot regarding problem with selection of type codes based on accuracy without incorporating integrity.
IP 09	CLOSED (IP37)	Chris Moody, Mitre/CAASD	Comment from 1090 MOPS ballot regarding the use of velocity subtypes 3 and 4.
IP 10	REJECTED	Chris Moody Mitre/CAASD	Comment from 1090 MOPS ballot questioning if VFR/IFR distinctions on data source requirements is proper.
IP 11	CLOSED (IP21)	Bob Hilb, UPS	Comment from 1090 MOPS ballot requesting clarification on the use of the “TCP Data Valid” subfield.

ADS-B MASPS Issue Papers (cont)

IP #	Current Status	Author	Description
IP 12	Rev A	Bob Hilb, UPS	Comments from 1090 MOPS ballot requesting broadcast of aircraft's CDTI and TCAS/ACAS capabilities and TCAS/ACAS RA information.
IP 13	Rev A	Rick Cassell, Rannoch Corp.	Comment from 1090 MOPS ballot regarding changing of broadcast rate from 0.5 seconds to 5.0 seconds.
IP 14	Rev A	Rick Cassell, Rannoch Corp.	Comments from 1090 MOPS ballot regarding the MOPS not addressing the use of a "certified navigation center" with own position.
IP 15	REJECTED	Stephen Heppe, ADSI, Inc	Proposal to consider altitude differential when determining effective received update rate.
IP 16	DEFFERED	Stephen Heppe, ADSI, Inc	State Vector reporting rate requirements for users transmitting TCPs
IP 17	REJECTED	Stephen Heppe, ADSI, Inc	Use of TIS-B for integrity enhancement
IP 18	Rev A	Gary Livack, FAA	Comments from 1090 MOPS ballot regarding broadcasting of own aircraft's heading at Vstop.
IP 19	Rev A	Gary Livack, FAA	Comments from 1090 MOPS ballot regarding broadcasting of own aircraft's brake "on" or "off" position. (change title to runway incursion alerting)
IP 20	CLOSED	Chris Moody, Mitre/CAASD	Comments from 1090 MOPS ballot regarding ambiguity of velocity subtypes.
IP 21	Rev A	Tony Warren, Boeing	TCP Types and parameters to represent trajectory Change segments.
IP 22	Rev A	Gary Livack, FAA	Means needed to support backwards compatibility between ADS-B versions.
IP 23	CLOSED (IP32)	Gary Livack, FAA	Ability to broadcast capability to perform specific applications.

ADS-B MASPS Issue Papers (cont)

IP #	Current Status	Author	Description
IP 24	CLOSED (IP8)	Gary Livack, FAA	NAC specificity requirements for surface applications
IP 25	DEFFERED	Gary Livack, FAA	Military formation flying message set.
IP 26	Rev A	Richard Barhydt, NASA	Format for incorporating Short ~~and Long Term~~ Intent Information.
IP 27	CLOSED (IP37)	Richard Barhydt, NASA	Benefits of including Heading and Airspeed in State Vector Report.
IP 28	CLOSED (IP37)	Stephen Heppe, ADSI, Inc	Air-referenced parameters should be excluded from normal/default State Vector transmissions.
IP 29	Rev A	Stephen Heppe, ADSI, Inc	The MASPS should not require geometric altitude in all SV reports.
IP 30	DEFFERED (plenary review needed	Stephen Heppe, ADSI, Inc	Proposed clarification for definition of ADS-B
IP 31	CLOSED (IP21)	Tony Warren, Boeing	TCP Update Rate Requirements
IP 32	Rev A	James Maynard, UPS-AT	Revise capability code definition
IP 33	Rev A	James Maynard, UPS-AT	Re-organize the SV and MS report elements
IP34	Rev A Low Priority	James Maynard, UPS-AT	Provide standard, data-link-independent, report structure format in the MASPS.
IP35	Rev A	Bill Harman, MIT LL	Delete or change note 7 of Table 3-4 to assure that this note does not change or supercede the requirements defined in Table 3-4.
IP36	Rev A	Gene Wong, FAA	Simultaneous Parallel Approach Ranges

ADS-B MASPS Issue Papers (cont)

IP #	Current Status	Author	Description
IP 37	Rev A	Richard Barhydt, NASA	Air Reference Velocity Vector (IPs 9, 27, 28, and 3X)
IP 38	DEFERRED	Gary Livack, FAA	How will ADS-B determine if a target helicopter is on the ground or in hover. Also, how will other aircraft determine if an airplane has just taken off?
IP 39	Rev A	Gary Livack, FAA	Does the vertical height integrity (NIC) value need to be the same as the horizontal integrity level so suitably equipped aircraft can perform ACM functions against ADS-B equipped TARGET aircraft?
IP 40	REJECTED	Gary Livack, FAA	Edit text of the ADS-B MASPS (DO-242), as needed, to embrace the notion that ADS-B application enabling software, at the discretion of the applicant, can be treated as discrete, modular software.
IP 41	New	Bill Flathers, AOPA	Emergency Locator Transmitters Functionality for General Aviation
IP 42	New	Bill Flathers, AOPA	GA transponder encoder and self-test feature
IP 43	New	Bill Flathers, AOPA	The Need for “Aircraft Address” in Very Dense Environments